Australian Government | Infrastructure Australia

Project business case evaluation summary

Newcastle Inner City Bypass - Rankin Park to Jesmond

Location
Newcastle, New South Wales

Geography
Smaller cities and regional centres

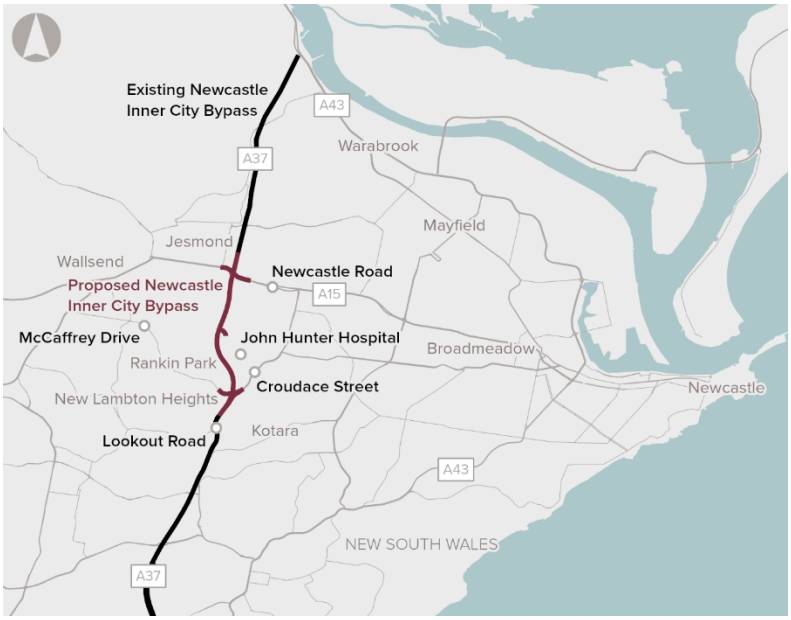
Category
Urban Congestion

Total Capital cost
$450 million (P90, outturn)

Indicative timeframe
Construction Start: 2022
Project completion by: 2025

Proponent
NSW Government

Evaluation date
15 April 2021



1. Evaluation Summary

We have evaluated the business case in accordance with the revised Statement of Expectations of 20 December 2020, which requires Infrastructure Australia to evaluate project proposals that are nationally significant or where Australian Government funding of $250 million or more is sought. The Newcastle Inner City Bypass business case proposes a solution to a nationally significant problem that is subject to an Australian Government funding commitment of $360 million.

The Newcastle Inner City Bypass is part of Transport for NSW's long-term strategy to connect the Pacific Highway between Bennetts Green and Sandgate. The Newcastle Inner City Bypass - Rankin Park to Jesmond (the project) is the fifth and final section to complete the Bypass, with the previous four sections being completed over the last four decades.

The inner Newcastle road network suffers from high levels of congestion, especially during morning and afternoon peak periods. Around 40,000 to 60,000 vehicles travel through the project area each day. The scale of traffic congestion, travel reliability and safety incidents will worsen in the future, given forecast population and demand growth in the area.

The project involves the construction of 3.4 kilometres of new four lane divided road between Lookout Road at New Lambton Heights and Newcastle Road at Jesmond. The project will improve travel times, transport reliability and reduce transport operating costs and road accidents. It will also improve access to the John Hunter Hospital Precinct and support its future expansion. The objectives of the project align with local, state and Australian Government priorities and strategies.

The proponent's business case reports a net present value (NPV) of $1,494 million, with a benefit-cost ratio (BCR) of 5.2 using a 7% real discount rate and P50 capital cost estimate when evaluated over a 30-year period. Our review found that the estimated costs and benefits are robust and we are confident that the project benefits will outweigh the estimated costs.

We support the proponent's proposed design and construct delivery approach, as it appropriately considers identified risks including, but not limited to, utilities, materials management and earthworks. The project is in an advanced stage of planning, with a 100% Detailed Design, and environmental approval from both the Australian Government and the NSW Government.

2. Context

The population growth rate of the Newcastle City Council Local Government Area is approximately 0.9% per annum. The proponent estimates that vehicle trips in the study area will grow by approximately 1.1% per annum due to population growth and increased demand of key services in the area including health services at the John Hunter Health and Innovation Precinct.

The Newcastle Inner City Bypass (the Bypass) is part of Transport for NSW's long-term strategy to improve traffic flow across the western suburbs of Newcastle and connect key destinations including Bennetts Green, Charlestown and Jesmond shopping centres, John Hunter Hospital, and Newcastle University.

The Rankin Park to Jesmond section (the project) is the fifth and final stage of the Bypass. The four other sections of the Bypass have been completed over the last four decades, with the project forming the middle section. For context, the Project is approximately 11 kilometres west of the Newcastle central business district.

The project will provide continuity for the Bypass, improved connectivity and traffic flows improvements across the western suburbs of Newcastle. Highway. More specifically, the proposed project will start from Lookout Road, New Lambton Heights, and will deviate to the west and traverse bushland, before connecting with the existing Jesmond to Shortland section of the Bypass at Newcastle Road, Jesmond.

In October 2020, the Australian Government announced $360 million of funding for the Rankin Park to Jesmond project. This is in addition to funds already received from the NSW Government of $90 million for completion of planning and design works, as well as some early stage construction including interchange upgrade at the John Hunter Hospital.

3. Problem description

The proponent's traffic analysis shows that the inner Newcastle road network suffers from high levels of congestion, especially during the daily AM and PM peak periods, with estimated traffic volumes in the order of 40,000 to 60,000 vehicles per day on this section of the Bypass. The proponent forecasts that the scale of traffic congestion, travel reliability and safety incidents will worsen in the future, given forecast population and demand growth in the area.

The proponent's traffic modelling shows that the existing route (the base case) of Lookout Road, Croudace Street and Newcastle Road will not be able to accommodate projected future traffic volumes. In particular, the proponent's economic appraisal identifies and monetises the following problems under the base case, when compared to the project case scenario:

- **Travel speed and time costs:** traffic congestion is estimated to cost an additional $152 million (undiscounted) in additional travel time costs, on average, per year. The proponent's traffic modelling estimates that the average travel speed across the lower hunter traffic network model, in the 2-hour peak periods, will drop from 27.2 km/h in 2020, to 20.8 km/hr by 2030 due to increased levels of congestion.
- **Vehicle operating costs:** traffic congestion in the base case is also estimated to result in additional vehicle operating costs of $37 million per year (undiscounted) on average, over the 30-year evaluation period, when compared to the project case.
- **Transport reliability issues:** road users will also have increasing travel reliability issues with growing congestion, since road users are typically required to apply a buffer time to their estimated journey times to account for potential variability. The proponent estimates that that this will result in an additional $6 million (undiscounted) per year, on average, in transport reliability costs.
- **Accidents:** a total of 164 crashes were recorded in the five-year period between April 2015 and March 2020 within the project area. As traffic increases over time, the frequency of crashes is expected to worsen. The proponent estimates that the project would reduce annual crashes by 11 incidents per year, resulting in potential savings of $1.3 million (undiscounted) per year through avoided accidents over the life of the project.
- **Externalities:** increasing congestion and traffic in the project area will also result in increased externality costs for the community, although relatively small in scale at less than $1 million (undiscounted) per year on average.

4. Options identification and assessment

A preferred route corridor for the project section of the Bypass was first identified in 1957 as part of the original plan for the Sydney to Newcastle Freeway (now the M1 Pacific Motorway). Since then, further route studies were undertaken in 1985 and 2006 to refine the project's alignment and ensure appropriate design and connectivity with the proposed development of the John Hunter Hospital precinct. In 2016, Transport for NSW undertook a comprehensive review of previous studies to further develop and refine the project option.

During the process, the proponent used multi-criteria analysis, stakeholder consultation, technical investigations and value management workshops. Traffic modelling was also a key input into the options development process to help understand traffic performance and project functionality. Additional project refinement and design changes were also considered, as part of the project's environmental impact statement and project exhibition process.

The consideration of road options only was appropriate, since the Rankin Park to Jesmond section, is the middle and final section that will link with the existing Newcastle Bypass. The proponent undertook extensive road option investigation, as discussed above, involving assessment and refinement of route alignment, northern interchange, southern interchange and hospital interchange option configurations.

The proponent investigated the opportunity to provide north-facing ramps at McCaffrey Drive and found that, while the ramps are technically feasible, they would not be economically justified given the relatively low level of forecast traffic use.

Infrastructure Australia considers the options identification and assessment process to be broadly appropriate.

5. Proposal

The proposed solution involves the construction of approximately 3.4 kilometres of new four lane divided road between Lookout Road at New Lambton Heights and Newcastle Road at Jesmond. The main elements of the project include:

- New road with two lanes in each direction, separated by a median
- Three interchanges, consisting of:
  - Northern interchange providing access to Newcastle Road and the existing Jesmond to Shortland section of the Bypass. The full interchange provides all movements to/from the Bypass and Newcastle Road.
  - Hospital interchange providing access between John Hunter Hospital precinct and the Bypass. The full interchange provides all movements to/from the Bypass and the hospital precinct.
  - Southern interchange providing access to Lookout Road and the existing Kotara to Rankin Park section of the Bypass. The Bypass would travel under McCaffrey Drive. The half interchange provides connection in both directions on Lookout Road.
- Structures along the road to allow for drainage, animal and bushwalker access
- Tie in and upgrades to connecting roads, including Lookout Road, McCaffrey Drive and Newcastle Road
- Large cut and fill embankments due to steep and undulating terrain
- Pedestrian and cycling facilities, including a shared path bridge over Newcastle Road and grade separation of east/west shared path at northern interchange (Jesmond park)
- Noise barriers and/or architectural treatment, as required
- Permanent operational water quality measures.

The project also involves ancillary works to facilitate construction of the project, including:

- Adjustment, relocation and/or protection of public utilities and services
- Mine subsidence treatment

- Temporary construction facilities, including sedimentation basins, compounds and stockpile sites
- Temporary and permanent access tracks
- Concrete/asphalt batching plant.

6. Strategic fit

The Rankin Park to Jesmond section is the middle and final section linking the existing Newcastle Inner City Bypass, which is part of the NSW Government's long-term strategy to improve connectivity traffic flow across the western suburbs of Newcastle. The proposed project will enable road users to bypass the existing 4.2-kilometre route of Lookout Road, Croudace Street and Newcastle Road and allow drivers to avoid up to 11 sets of traffic lights, resulting in improved traffic flow and safety outcomes for motorists travelling on the bypass and surrounding Newcastle network.

The objectives of the project align with several Government priorities and strategies, including but not limited to the NSW Future Transport Strategy 2056; Greater Newcastle Future Transport Plan and Hunter Regional Plan 2036. In general, the project aligns to these strategic plans and objectives by improving vehicle travel times, transport reliability and reducing accidents.

The project will also complement the developing John Hunter Health and Innovation Precinct, planned for completion in 2025. The health precinct will include updated and enhanced facilities to meet the needs of people living in the Greater Newcastle, Hunter, New England and northern NSW Regions. The Bypass will improve access to the health precinct, particularly through the provision of a new interchange/access point to the western side of the precinct.

7. Economic, social and environmental value

The proponent's business case states that the net present value (NPV) of the project is estimated to be $1,494 million with a benefit-cost ratio (BCR) of 5.2, using a 7% real discount rate and a P50 capital cost estimate. We have considered the sensitivity of the appraisal to the discount rate and note that:

- Using a 4% discount rate results in a NPV of $2,544 million and a BCR of 7.7.
- Using a 10% discount rate results in a NPV of $910 million and a BCR of 3.7.

The majority of project benefits include travel time savings, which comprise of 76%, and vehicle operating cost savings, comprising of 19%, of total project benefits. The remaining 5% of project benefits comprise of reliability benefits (3%); crash cost savings (0.72%); residual value benefits (0.82%) and environmental externalities (0.07%).

Our review identified some minor limitations with the analysis:

- The proponent's economic appraisal included $59.4 million in sunk costs, which is not recommended in the Infrastructure Australia Assessment Framework. Excluding sunk costs increases the NPV and BCR of the project to $1,554 million and 6.2 respectively.
- The proponent's economic appraisal slightly underestimates the value of externality benefits which total $1 million (discounted) of project benefits. While the proponent's distance-based approach (i.e. vehicle-kilometres-travelled) is appropriate, it underestimates the project's externality benefits as it does not capture the benefits associated with reduced vehicle idle and stop times typical for this type of project.
- The estimated project's reliability benefits may be slightly overstated given that reliability benefits are expected to be significantly reduced for vehicles travelling outside peak periods. However, given that reliability benefits make up less than 5% of total project benefits, the overall impact on the results of the evaluation is minimal.

Overall, the adjustments do not significantly change the outcomes of the analysis and the project's benefits are expected to significantly exceed the estimated costs.

The proponent has considered COVID-19 pandemic impacts assuming changes in growth rates and seasonality of traffic demand. The short-term impacts of COVID-19 have been felt through a reduction in daily traffic demand. However, it is considered unlikely that negative growth would persist in the medium-to-long-term.

To estimate the effects of COVID-19, some changes were incorporated into the traffic modelling outputs such as long-term population growth reduced by 4% for the evaluation period; demand for public transport is reduced more than demand for car trips; and that a 0.5% increase in traffic demand for years 2020-2030 only and work from home further reduce Journey-To-Work trips by 5%, applied for years 2020-2030. After 2030 it is assumed that this increase in demand reverts to public transport.

The results of the COVID-19 sensitivity tests indicate that the project's BCR is reduced slightly to 5.0 from 5.2 at P50 cost estimates.

The table below presents a breakdown of the proponent's stated benefits and costs.

Benefits and costs breakdown

Proponent's stated benefits and costs	Present value ($M, 2020/21) @ 7% real discount rate		% of total
Benefits			
Vehicle Travel Time Savings	$1,409.6		76.2%
Vehicle Operating Cost Savings	$356.4		19.3%
Travel Reliability Savings	$54.7		3.0%
Externalities Savings	$1.3		0.1%
Accident Cost Savings	$13.2		0.7%
Residual Value of Asset	$15.1		0.8%
Total Benefits[1]	**$1,850.2**	(A)	**100%**
Total capital costs (P50)	$353.0		99.1%
Operating costs	$3.1		0.9%
Total Costs[1]	**$356.1**	(B)	**100%**
Net benefits - Net present value (NPV)[2]	**$1,494.2**	(C)	n/a
Benefit-cost ratio (BCR)[3]	**5.2**	(D)	n/a

Source: Proponent's business case

(1) Totals may not sum due to rounding.
(2) The net present value (C) is calculated as the present value of total benefits less the present value of total costs (A – B).
(3) The benefit–cost ratio (D) is calculated as the present value of total benefits divided by the present value of total costs (A ÷ B).

The proponent's reported capital costs and funding is presented in the following table.

Capital costs and funding	
Total capital cost	$409.3 million (P50, undiscounted) $427.5 million (P90, undiscounted)
Australian Government funding contribution (committed)	$360 million (P90, outturn dollars)
Other funding (NSW Government)	$90 million (released to date)

Source: Proponent's business case

The funding commitments of the Australian Government and the NSW Government were based on a total project cost estimate of $450 million, which exceeds the undiscounted P90 cost estimate of $427.5 million.

8. Deliverability

A 100% Detailed Design was completed for the project in 2020 and used to inform the cost estimates for the project, giving a high degree of confidence in the project scope.

The project has received environmental approval from the Australian Government and the NSW Government. The proponent exhibited an Environmental Impact Statement for the project in 2016, which resulted in a number of design changes including additional south-facing ramps at the proposed hospital interchange. The project received approval from the NSW Minister of Planning on 15 February 2019, and from the Commonwealth Minister for Environment under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) on 15 April 2019.

Transport for NSW considered a broad range of procurement models, including a public-private partnership, and has chosen to deliver the project in three components – a main works construction package and two early-stage construction packages. The main works package will be delivered as a Design and Construct package, while the early works packages will be procured using a detailed design professional services contract (PSC) with a separate Construct Only (GC21) contract. This delivery approach is appropriate given Transport for NSW's experience in delivering similar projects and the identified project risks.

The first early-stage works package involves construction of a new shared path bridge over Newcastle Road. This package of works has already been funded and was completed in March 2021. The second early-works package involves relocating a number of utilities at the southern section of the corridor prior to commencement of the main works of the project. Construction works for the southern utilities relocation component is scheduled to commence in mid-2021 and be completed by mid-2022, with funding already released by the NSW State Government.

Procurement for the main works commenced in February 2021 with contract award planned for early 2022. Project construction is planned to commence in mid-2022 with traffic operations planned to begin in late 2025. Transport for NSW is the main road delivery agency in NSW and has delivered many road projects of this nature and scale. The project is being managed through the Newcastle Regional Program Office, Technical and Project Services Division.

The proponent has developed a comprehensive risk register that considers various design, technical, construction, and organisational risk factors for the project. The proponent's risk analysis identified the following very high project risks:

- Encountering unexpected adverse site and geotechnical conditions during construction, resulting in scope and capital cost variations;
- The delay of the southern utility relocation works, resulting in delays for the project's main works; and
- Potential construction timing issues related with the completion of the Bypass interchange and John Hunter Hospital interface components.

To mitigate the risk associated with the southern utilities, the proponent has successfully gained approval from all relevant utility authorities and will undertake a significant amount of (early-stage) utility works before the start of the project's main works. The proponent has also undertaken geotechnical investigations to profile and understand site conditions. This will assist with project planning and may reduce the risk and cost of encountering unexpected adverse site conditions during the construction phase.

While the risk analysis and proposed mitigation measures are considered to be reasonable at this stage of project development, further risk analysis, monitoring and mitigation measures will need to be undertaken throughout future project development and construction stages. This is particularly important given that, historically, some Australian projects have experienced major cost overruns due to geotechnical and utilities issues.

The proponent recognises that the construction of the John Hunter Hospital and the project, both planned for completion in 2025, will need to be co-ordinated to reduce the risk of inter-project impacts on the operational functionality of the hospital.

A Benefits Realisation Management Plan has been developed in accordance with the NSW Department of Finance, Services & Innovation Benefits Realisation Management Framework. The benefits realisation plan adequately summarises the project's objectives; expected project benefits; and relevant performance and measurement indicators; and broadly aligns with the project's economic analysis.

Infrastructure Australia encourages the proponent to undertake and publicly release a post completion review to assess the extent to which expected project benefits and costs have been realised. This will help to inform future projects and should assess project costs and outcomes for

customers, against the expectations set out in the business case.

Consideration of COVID-19

The COVID-19 pandemic has significantly affected the use of infrastructure. Infrastructure Australia has been working collaboratively with the Australian Government to provide advice on a staged response for managing, and recovering from, the impacts of the COVID-19 pandemic.

One critical element of our advice is to maintain a pipeline of nationally significant infrastructure investments. Nationally significant infrastructure projects are long-term investments, typically considering a 30-year view of the project's social, environmental and economic impacts. In evaluating the business case for this project, Infrastructure Australia continues to take a long-term view and has also considered the sensitivity of key planning assumptions using the best data available to us.

As noted in the 2019 Australian Infrastructure Audit, we must continue to evolve the way we plan for Australia's infrastructure to embrace uncertainty. There are still many uncertainties regarding the long-term impact of the COVID-19 pandemic on infrastructure use.

We will continue to collaborate with industry, the community and governments at all levels to understand the impacts of the COVID-19 pandemic on infrastructure decisions in Australia.